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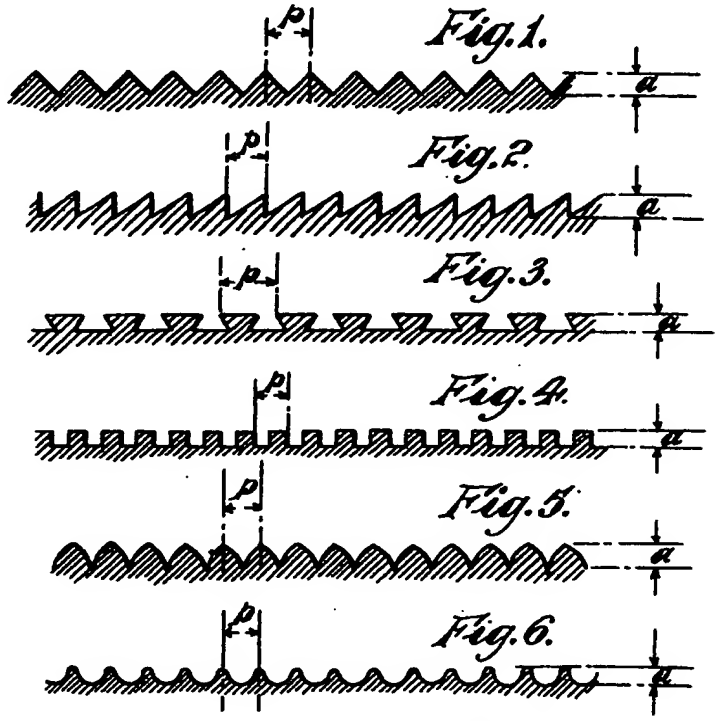

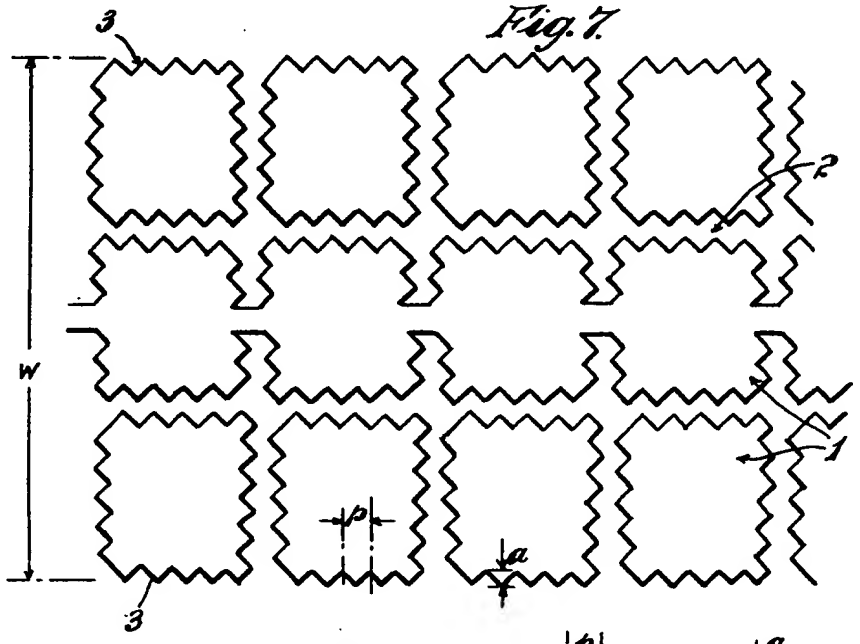

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[Second Edition.]

PATENT SPECIFICATION

Application Date: Jan. 25, 1936. *No. 2373/36.* **460,338**

Complete Specification Left: July 1, 1936.

Complete Specification Accepted: Jan. 26, 1937.

PROVISIONAL SPECIFICATION

Improvements in Tyres for Vehicles.

We, DUNLOP RUBBER COMPANY LIMITED, a British Company of 32, Osnaburgh Street, London, N.W.1, FRANK GEORGE WILLIAM KING and LEONARD JOHN LAMBOURN, both British Subjects and both of the aforesaid Company's Works at Fort Dunlop, Erdington, Birmingham, in the County of Warwick, do hereby declare the nature of this invention to be as follows:—

This invention concerns improvements in tyres for vehicles and in particular concerns improvements in treads of pneumatic tyres especially those which are moulded from compositions of or containing india-rubber.

The treads of such tyres are commonly formed with a pattern comprising upstanding ribs and/or a plurality of studs each of which pattern units presents a working surface to that of the road.

The edges formed between the working surfaces of the tread pattern units and their radially extending wall portions contribute materially to the road-holding non-skid properties of the tyre.

The main object of the present invention is the provision of a tread composed of tread pattern units which may be of known types having working surfaces of substantial area, but in which the edges of such units constituting the tread are shaped in a particular manner so as to provide not only a greater increased total length of edge, but also an edge of a shape particularly adapted to improve the road-holding qualities of the tyre.

The formation or shape of the edges of the tread pattern units to be described also provides a less concentrated distribution of stress at the root portions of the pattern units.

According to this invention a tyre tread comprises upstanding road contacts having working surfaces, the edge portions of some or all of which are characterised by grouped or continuous corrugations, serrations, or otherwise irregularly shaped teeth or similar forms of projections.

Such irregular edges are integrally moulded or cut in the upstanding wall portions of the majority or of all the said road contacts, preferably in the form of continuous bands of serrations or corrugations which extend throughout the whole or the major portion of the total length presented to the road by such contacts.

Such projections or indentations may have a pitch and amplitude which may be defined respectively as the distance between successive salients, and the depth of any salient measured perpendicularly from its apex to its base.

For instance, the edge portions may consist wholly or mainly of serrations, the pitch of which does not exceed 16 mm. and the amplitude of which does not exceed 8 mm.

While the above maximum values of pitch and amplitude are considered the maximum values desirable for pneumatic tyres of the largest section, we arrange that such values should not exceed a definite proportion of the tread width, (which is the distance between the edges of the tread measured across the arc of the tread) having regard to the fact that the projections are an adjunct or modification of the tread pattern proper and do not themselves necessarily constitute the main configuration of the tread pattern.

Preferably, the ratios of pitch and amplitude to the tread width do not exceed $^1/_8$ and $^1/_{16}$ respectively.

While it will be realised that there are many varieties of irregular edges, the following particular forms may be more particularly described.

For example, where serrations are used, these may take the form of continuous series of salient and re-entrant portions, the convergent sides of which meet at right angles to one another and which are inclined at about 45° or other angle to the midplane of the tyre and are of equal or nearly equal length approximating to 5 or 6 mm.

It may, however, be convenient to modify these lengths slightly as for instance, in tyres having circumferentially or transversely sinuous ribs by making alternate sides of the serrations of unequal length and about 6 and 4 mm. long respectively, whereby the curvature

of the rib may be conveniently followed while retaining the required angle between the sides.

We may, however, vary the lengths and angles of the faces of the projections to the midplane of the tyre in any suitable manner, for instance one face may be at right angles to the midplane of the tyre and the other at an angle of 45°.

Where corrugations are used, these may consist of adjacent semi-circular projections of about 6 mm. diameter.

A third type consists of a succession of square or wedge-shaped projections, the three sides of each projection being of the order of 5 mm. in length and being separated by re-entrant portions of the same order of length.

Indentations upon adjacent edges of the ribs or studs constituting the general pattern of the tyre tread may be arranged so that the salient parts between the indentations on the one rib or stud coincide with the re-entrant portions on the rib or stud opposite.

The overall width of the groove defined by the apices of the re-entrant portions of the adjacent ribs or studs may be of the order of 10 mm. or less, but when the salient portions are staggered so as not to be directly opposite to one another, the salients may approach closely to a distance of the order of 1 mm. from the centre line of the groove separating any two such ribs or studs, or may pass beyond such a line so as to intermesh with one another.

The ribs or studs of any tyre may be modified as described by serrations only, or by corrugations only, or by square castellations or a mixture of these or other forms.

The width of the grooves between the studs or ribs may diminish slightly towards their bases as compared with the width of the grooves at the working surfaces of adjacent studs or ribs, and the bases of the studs and their projections may merge into the foundation surfaces of the groove with suitable curvature.

The said indentations may be wholly restricted to the marginal edge portions of the majority of the substantially flat working surfaces of the ribs or studs, for instance, the overall width of a road contacting rib or stud may be 20 mm. and the width of each of the indented marginal portions may be of the order of 5 mm. or less.

The length of a portion of the working surface of a non-skid stud or rib which is say 40 mm. long, may be increased by 50% to a length of 60 mm. by serrating its edge, the whole of the additional length being effective for increased road-holding purposes.

If desired the projections may be moulded initially to stand above the edges of the working surfaces of the road contacts but whether so initially moulded or moulded to the same level as that of the working surfaces, the projections are constantly renewed in outline by abrasive contact with the road surface.

If desired the projections may be moulded of different sections at different depths so that as the tread wears down, a different edge formation is displayed and brought into use.

Dated this 24th day of January, 1936.

W. BOND,
Acting for the Applicants.

COMPLETE SPECIFICATION

Improvements in Tyres for Vehicles.

We, DUNLOP RUBBER COMPANY LIMITED, a British Company of 32, Osnaburgh Street, London, N.W.1, FRANK GEORGE WILLIAM KING and LEONARD JOHN LAMBOURN, both British Subjects and both of the aforesaid Company's Works at Fort Dunlop, Erdington, Birmingham, in the County of Warwick, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement :—

This invention concerns improvements in tyres for vehicles and in particular concerns improvements in treads of pneumatic tyres especially those which are moulded from compositions of or containing india-rubber.

The treads of such tyres are commonly formed with a pattern comprising upstanding ribs and/or a plurality of studs each of which pattern units presents a working surface to that of the road.

The edges formed between the working surfaces of the tread pattern units and their radially extending wall portions contribute materially to the road holding non-skid properties of the tyre.

The main object of the present invention is the provision of a tread composed of tread pattern units which may be of known types having working surfaces of substantial area, but in which the edges of such units constituting the tread are shaped in a particular manner so as to provide not only a greatly increased total length of edge, but also an edge of a shape

particularly adapted to improve road holding qualities of the tyre.

The formation or shape of the edges of the tread pattern units to be described also provides a less concentrated distribution of stress at the root portions of the pattern units.

Some of the large number of tread patterns disclosed by the prior art are shown for instance, in the 1922 edition of Pearson's "Pneumatic Tyres", and a number of these patterns embody pattern units in the form of star-shaped studs and.or circumferential or transverse ribs of zig-zag formation.

In most of these patterns however, the indented portions of the edges of the pattern units are of sufficient size to clearly maintain their identity as such even when seen at a distance or when reduced to small scale illustrations.

In some of these patterns, when moulded to full size, the tapering pointed portions produced by the indentations referred to, present in themselves comparatively long but narrow surfaces which not only form an essential part of the pattern but also initially sustain a substantial proportion of the load imposed on each pattern unit.

There is in some cases, a tendency for such tapering major projections to wear away rapidly and to induce a more rapid rate of wear in the remaining portions of the pattern units of which they form a substantial part. In others the irregular shapes are introduced to provide a differentiation of pattern or in some cases simply to provide a decorative effect.

In contradistinction to the above, we superpose upon an existing tread pattern a particular kind of edge formation consisting of minor indentations which are selected of such an order of size in relation to the width of the tread and pattern units, that substantially the whole of the load and wear is permanently sustained by the relatively broad road contacting surfaces of the units of the original pattern.

In consequence, the minor indentations so superposed preserve their effectiveness, since they do not wear away unduly fast themselves, nor do they induce a faster rate of wear upon the units of the pattern upon which they are superposed.

The effectiveness of the original or basic tread pattern is thus preserved in regard to both its distinctiveness which is dependent upon the shape and grouping of the various pattern units, and the abrasion resisting qualities of such units, while at the same time we confer the maximum protection against slip by the edge formation superposed upon the whole or the major portion of all edges presented to the road by the existing pattern.

According to this invention, a tyre tread comprises upstanding projections such as ribs and/or studs arranged in a pattern which constitutes the effective load sustaining portions of the tread in contact with the road, the marginal portions of which projections are characterised by a saw-toothed, corrugated or like formation superposed thereon, which extends throughout the whole or the major portion of the total length of edge presented by such projections throughout the tread, the pitch and amplitude of which serrations, corrugations, or the like respectively do not exceed one tenth and one twentieth of the total width of the tread.

Such irregular edges are integrally moulded or cut in the upstanding wall portions of the majority or of all of the said road contacts, preferably in the form of continuous bands of serrations or corrugations which extend throughout the whole or the major portion of the total length presented to the road by such contacts.

In order that the invention may be more easily understood and readily carried into effect, the same will now be described with reference to the accompanying drawings in which :—

Figs. 1 to 6 show various forms of indented edge according to the invention, Fig. 7 shows portions of a tyre tread in plan view, and Fig. 8 shows two edges having closely adjacent indentations.

The upstanding tread projections are formed with road contacting surfaces 1 of substantial area bordered by indentations having a pitch p defined as the distance between successive salients, and an amplitude a defined as the depth of any salient measured perpendicularly from its apex to its base, the actual dimensions of which indentations do not exceed the specified proportions of the tread width w, (which is the distance between the edges 3 of the tread measured across the arc of the tread) having regard to the fact that the indentations are an adjunct or modification of the tread pattern proper and do not themselves constitute the main configuration of the tread pattern which is dependent on the size and arrangement of the road contacting surfaces 1.

While it will be realised that there are many varieties of irregular edges, obtainable with teeth of symmetrical or asymmetrical shape the following are more particularly described.

For example, where serrations are used as in Figs. 1 and 7, serrations take the

form of continuous series of salient and re-entrant portions, the convergent sides of which meet at right angles to one another and are of equal or nearly equal length.

It may, however, be convenient to modify the shape of these indentations slightly as for instance, in tyres having circumferentially or transversely sinuous ribs by making alternate sides of some of the serrations of unequal length, whereby the curvature of the rib may be conveniently followed while retaining the angle of 90° or other required angle between the sides.

We may, however, vary the lengths and angles of the faces of the projections to the midplane of the tyre in any suitable manner, for instance one face may be at right angles to the midplane of the tyre and the other at an angle of 45° as shown in Fig. 2.

Where corrugations are used, these may consist of adjacent approximately semi-circular projections or re-entrant portions as shown in Figs. 5 and 6 respectively.

A succession of square or wedge-shaped projections may also be used as shown in Figs. 4 and 3, the three sides of each square projection being separated by re-entrant portions of the same order of length, as the sides.

The indentations upon adjacent edges of the ribs or studs constituting the general pattern of the tyre tread are preferably arranged as shown in Fig. 7, so that the salient parts between the indentations on the one rib or stud coincide with the re-entrant portions on the rib or stud opposite.

The overall width of the grooves 2 defined by the apices of the re-entrant portions of the adjacent ribs or studs may be of the order of 10 mm. or less, but when the salient portions are staggered as described above, so as not to be directly opposite to one another as shown in Fig. 7, the salients may approach closely (to a distance of the order of 1 mm.) the centre line of the groove separating any two such ribs or studs, or may pass beyond such a line so as to intermesh or nearly intermesh with one another as shown in Fig. 8.

The ribs or studs of any tyre tread may be modified as described by serrations only, or by corrugations only, or by square castellations or a mixture of these or other forms.

The width of the grooves between the studs or ribs may diminish slightly towards their bases as compared with the width of the grooves at the working surfaces of adjacent studs or ribs, and the bases of the studs and their projections may merge into the foundation surfaces of the groove with suitable curvature.

The said indentations are wholly restricted to the marginal edge portions of the majority of the substantially flat working surfaces of the ribs or studs, whereby the length of a portion of the working surface of a non-skid stud or rib which is say 40 mm. long, may be increased by 50% to a length of 60 mm., the whole of the additional length being effective for increased road-holding purposes.

If desired the projections may be moulded initially to stand above the edges of the working surfaces of the road contacts but whether so initially moulded or moulded to the same level as that of the working surfaces, the outline presented by the projections remains substantially unaffected as the road contacting surfaces wear down in abrasive contact with the road.

If desired the projections may be moulded of different sections at different depths so that as the tread wears down, a different edge formation is displayed and brought into use.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is :—

1. A tyre tread comprising upstanding projections such as ribs and/or studs arranged in a pattern which constitutes the effective load sustaining portions of the tread in contact with the road, the marginal portions of which projections are characterised by a saw toothed, corrugated, or like formation superposed thereon, which extends throughout the whole or the major portion of the total length of edge presented by such projections throughout the tread, the pitch and amplitude of which serrations, corrugations or the like respectively do not exceed one tenth and one twentieth of the total width of the tread.

2. A tread according to the preceding claim characterised by adjacent indented edges, the salient and re-entrant portions of one of which register respectively with the re-entrant and salient portions of the other.

3. A tread according to either of the preceding claims characterised by projections formed with indentations of different shapes at different tread levels.

4. Pneumatic tyres having tread patterns of which the edges of the studs or ribs forming the patterns are shaped substantially as described with reference to the accompanying drawings.

Dated this 30th day of June, 1936.

W. BOND,
Acting for the Applicants.

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[Wt. 8138.—50/12/1939.]